Application No. 10/074,600
Filed: February 12, 2002
TC Art Unit: 2157
Confirmation No.: 4837

REMARKS

In response to an Office Acton mailed on October 3, 2005 and an Advisory Action mailed on December 28, 2005, Applicant now files these Amendments and remarks, along with a Request for Continued Examination (RCE). The Applicant respectfully requests that the above listed Amendments be entered and the Application be reconsidered in light of the following Remarks. However, the Applicant hereby requests a telephonic Examiner Interview after the Examiner has reviewed these Amendments and these Remarks, but before the Examiner issues an Office Action. The Examiner is asked to contact the undersigned attorney (at telephone number 617-542-2290) to select a mutually agreeable time for the interview.

The preamble of claim 9 is amended to correct a minor typographical error.

In the Advisory Action, the Examiner maintained the previous rejection of claims 1-16 under 35 U.S.C. 102(e) as being anticipated by US Pat. No. 6,331,985 to Coden ("Coden"). The Examiner cited Coden (col. 10, line 64 to col. 11, line 30 and col. 3, line 59 to col. 4, line 8) as disclosing, "forward[ing] the received packet as a unicast transmission to the first bridge on the ring in the event that the association between the first bridge and the end station has been learned," as recited in claim 1. The Applicant respectfully traverses this rejection, as discussed in detail below, but first, an example of a ring network according to the present Application is described with reference to embedded Figs. 1-8. This example corresponds to the example included in the Application on pages 9-11.

Fig. 1 (below) shows a ring network that includes three rings (Ring 1, Ring 2 and Ring 3). Each ring includes bridges (3 and 6), as well as several end stations (1, 2, 4, 5, 7, 8, 9 and 10). End stations can also be bridges. The end stations are the ultimate sources and destinations of packets. The end stations can include web servers, network routers (for connection to other networks, not shown), etc.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

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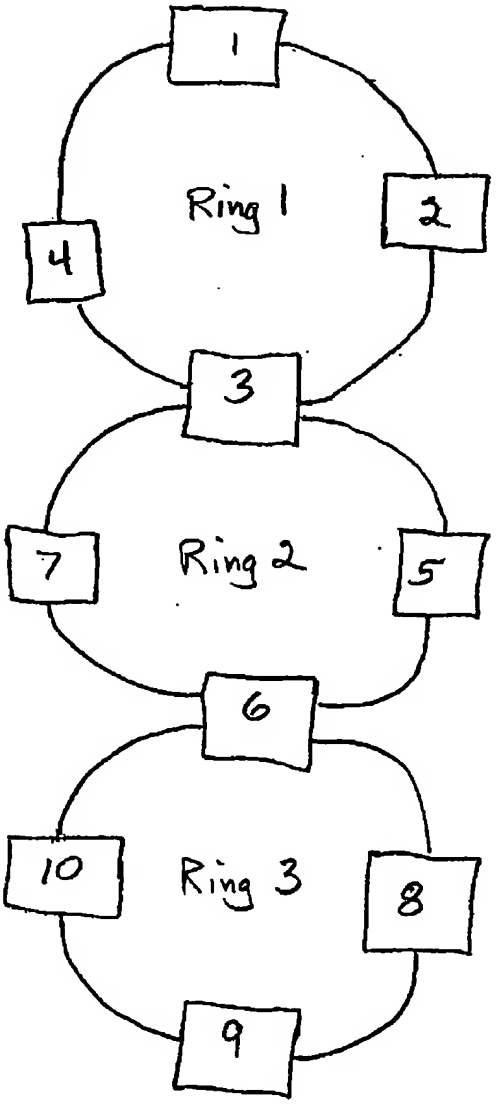

Fig. 1

Bridge 3 Associations

End Station	Bridge

Bridge 6 Associations

End Station	Bridge

Bridge 9 Associations

End Station	Bridge

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GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

Packets travel along the rings and enter (and sometimes travel through) the bridges. Each packet includes a source address, a destination address and an "ingress identifier." The ingress ID indicates which bridge introduced the packet to the ring along which the packet is currently traveling. The ingress ID need not be equal to the source address. For example, the packet's source might be on another ring, and the packet might have traveled across several rings to reach its current location.

As a packet travels along a ring and enters a bridge, the bridge observes the source and destination addresses and the ingress ID of the packet. The bridge can, thus, learn an association between the source address (end station) of the packet and the bridge by which the packet entered the ring.

For the example that is presented below, assume none of the bridges initially stores any associations between end stations and bridges, as shown by the empty "Associations" tables (Fig. 1).

In Fig. 2, End Station 1 sends a packet (Packet 1) to End Station 9. Therefore, the packet source address (SA) is 1, and the packet destination address (DA) is 9. Because the packet enters the ring (Ring 1) via End Station 1, the Ingress ID is 1. Because the sender (i.e., End Station 1) has no information indicating that the destination can be reached via any particular bridge (i.e., its Associations table has no entry corresponding to end Station 9), the Egress ID is set to "broadcast," and the packet will circulate around the entire Ring 1.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
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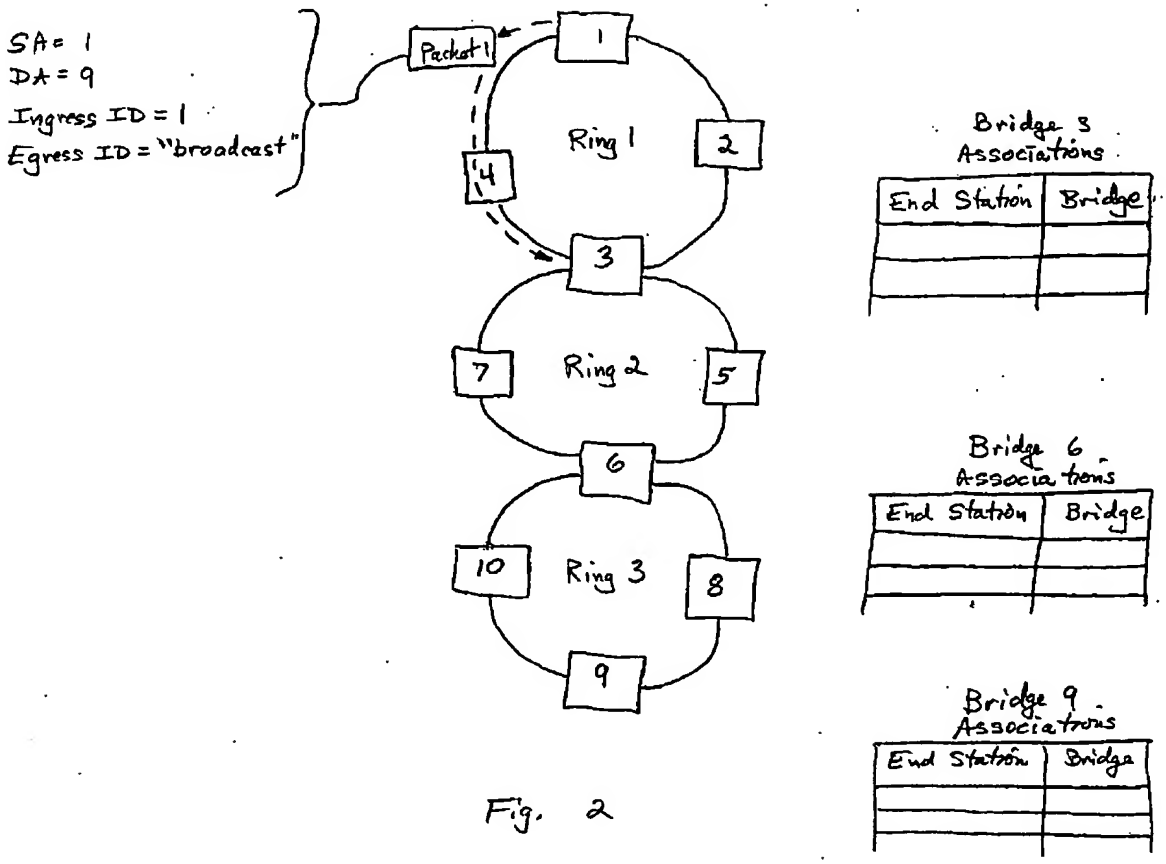

Fig. 2

As shown in Fig. 3, Packet 1 continues around Ring 1 until it reaches End Station 1, which removes the packet from the ring.

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GAGNEBIN & LEBOVICI LLP
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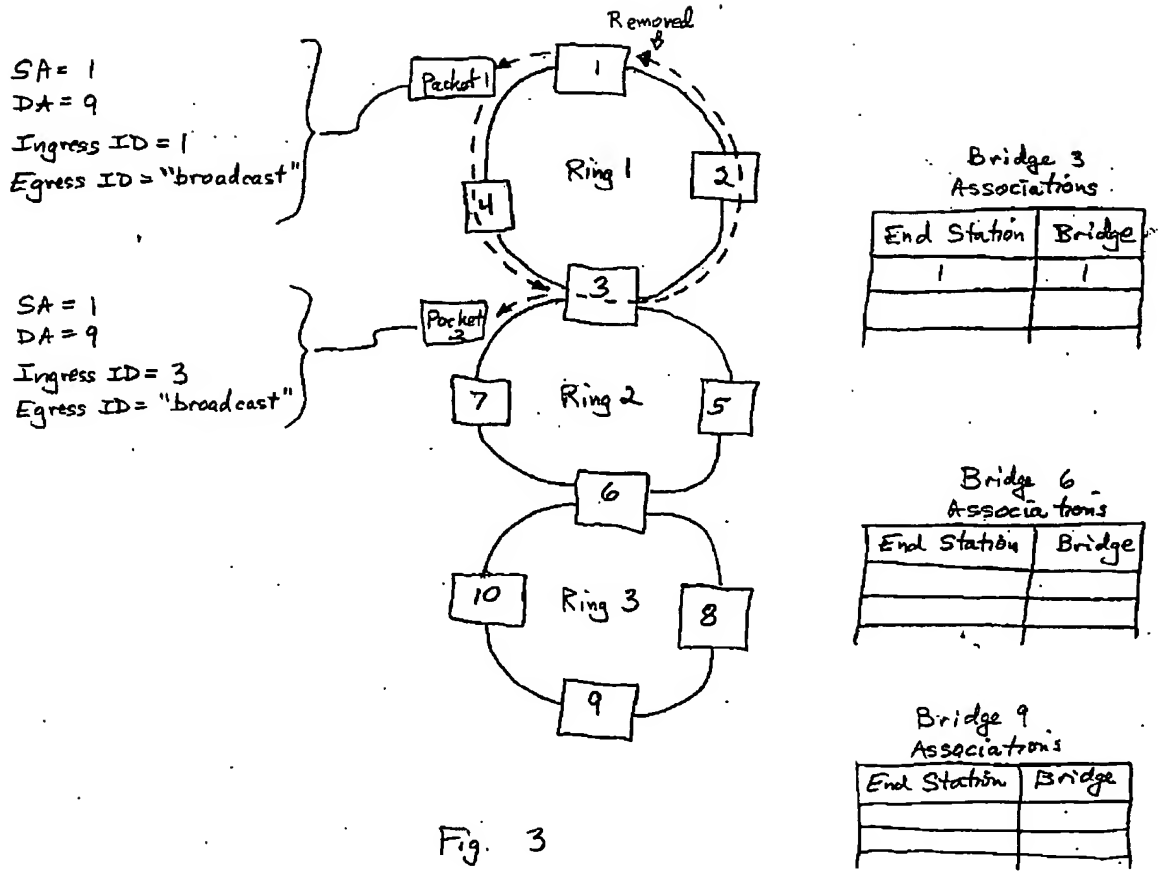

Fig. 3

On its way around Ring 1, Packet 1 reaches Bridge 3. The packet has a source address of 1. Thus, Bridge 3 learns that packets whose destination addresses equal 1 can exit Ring 1 on their way to their destination via the same bridge that was used to introduce Packet 1 into Ring 1. Packet 1's Ingress ID indicates the bridge (1) by which the packet entered Ring 1. Bridge 3, therefore, associates End Station 1 (a destination address) with Bridge 1 (a way for packets to exit Ring 1 on their way to the destination address). This association is shown in the "Bridge 3 Associations" table.

Bridge 3 also broadcasts a copy of Packet 1 on Ring 2. That is, Bridge 3 generates a packet (Packet 2) and sends the packet around Ring 2. Packet 2 has the same source and destination addresses as Packet 1. Packet 2 also has an Egress ID of "broadcast," because the sender (i.e.,

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

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Bridge 3) has no information indicating that the destination can be reached via any particular bridge. Packet 2 has an Ingress ID of 3, because the packet entered the ring (Ring 2) via Bridge 3. As shown in Fig. 4, Packet 2 circulates around Ring 2 and is removed from the ring by Bridge 3.

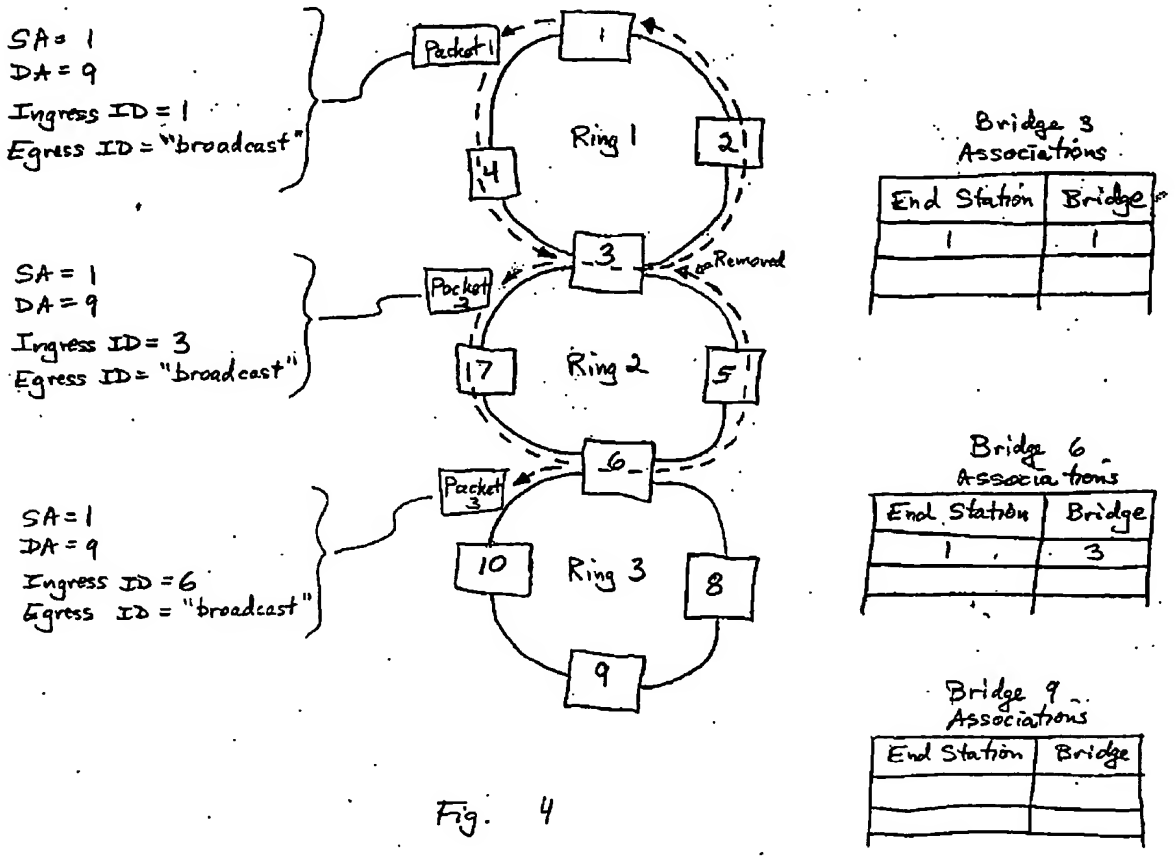

Fig. 4

On its way around Ring 2, Packet 2 reaches Bridge 6. The packet has a source address of 1 and an Ingress ID of 3. Thus, Bridge 6 learns that packets whose destination addresses equal 1 can exit Ring 2 on their way to their destination via the same bridge that was used to introduce Packet 2 into Ring 2. Bridge 6 associates End Station 1 (a destination address) with Bridge 3, as shown in the "Bridge 6 Associations" table.

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GAGNEBIN & LEBOVICI LLP
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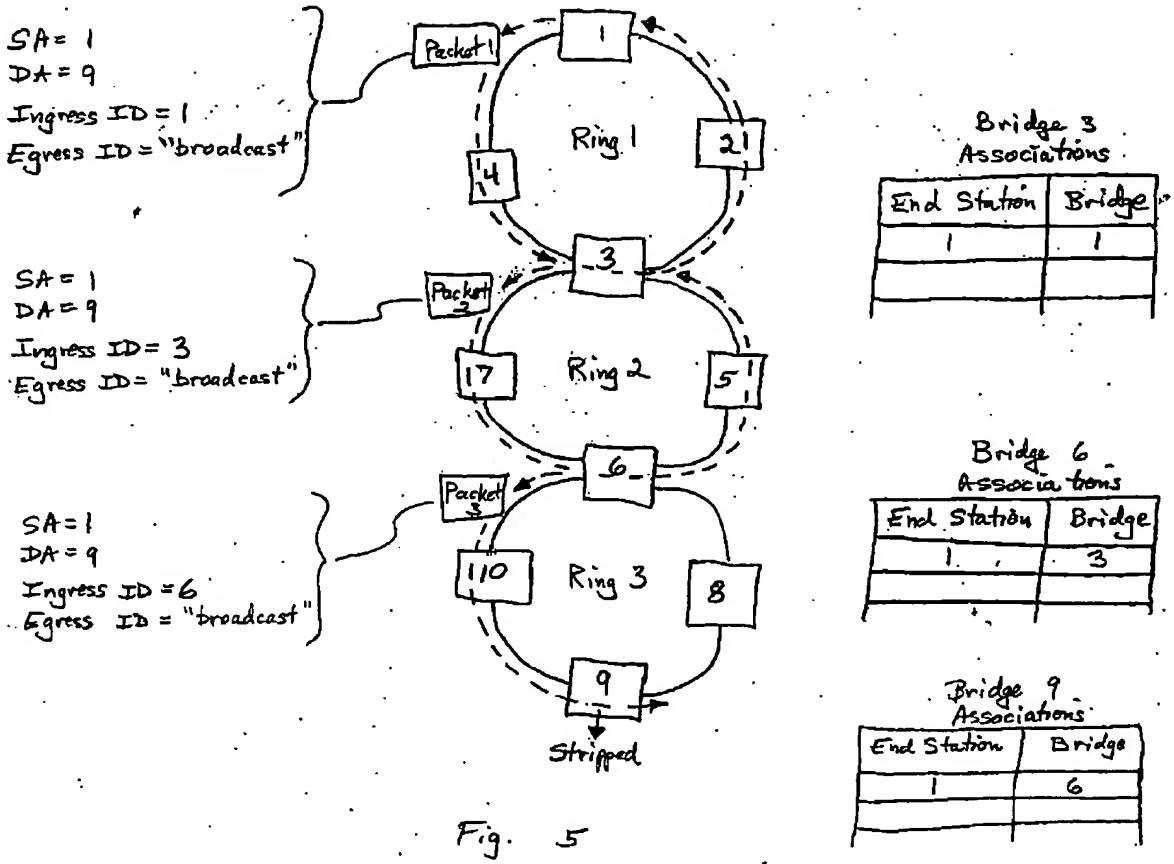

Fig. 5

Bridge 6 also broadcasts a copy (Packet 3) of Packet 2 on Ring 3. Packet 3 has the same source and destination addresses as Packets 1 and 2, and Packet 3 is broadcast around Ring 3. Packet 3 has an Ingress ID of 6, because the packet entered Ring 3 via Bridge 6.

As shown in Fig. 5, when Packet 3 reaches its destination (i.e., End Station 9), the End Station/Bridge 9 strips the packet's contents from the ring and associates the packet's source address (1) with Bridge 6, which is how the packet was introduced into Ring 3, as shown in the "Bridge 9 Associations" table.

Later, as shown in Fig. 6, if End Station/Bridge 9 introduces a packet (Packet 4) into Ring 3 and destined to End Station 1, End Station/Bridge 9 does not need to broadcast the packet around the Ring. End Station/Bridge 9 previously associated the destination address (1) with a bridge (6),

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GAGNEBIN & LEBOVICI LLP
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FAX. (617) 451-0313

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by which the packet can exit Ring 3 on its way to its destination. Thus, End Station/Bridge 9 sends Packet 4 as a unicast transmission to Bridge 6. Note that End Station/Bridge 9 sets the Egress ID of Packet 4 to 6.

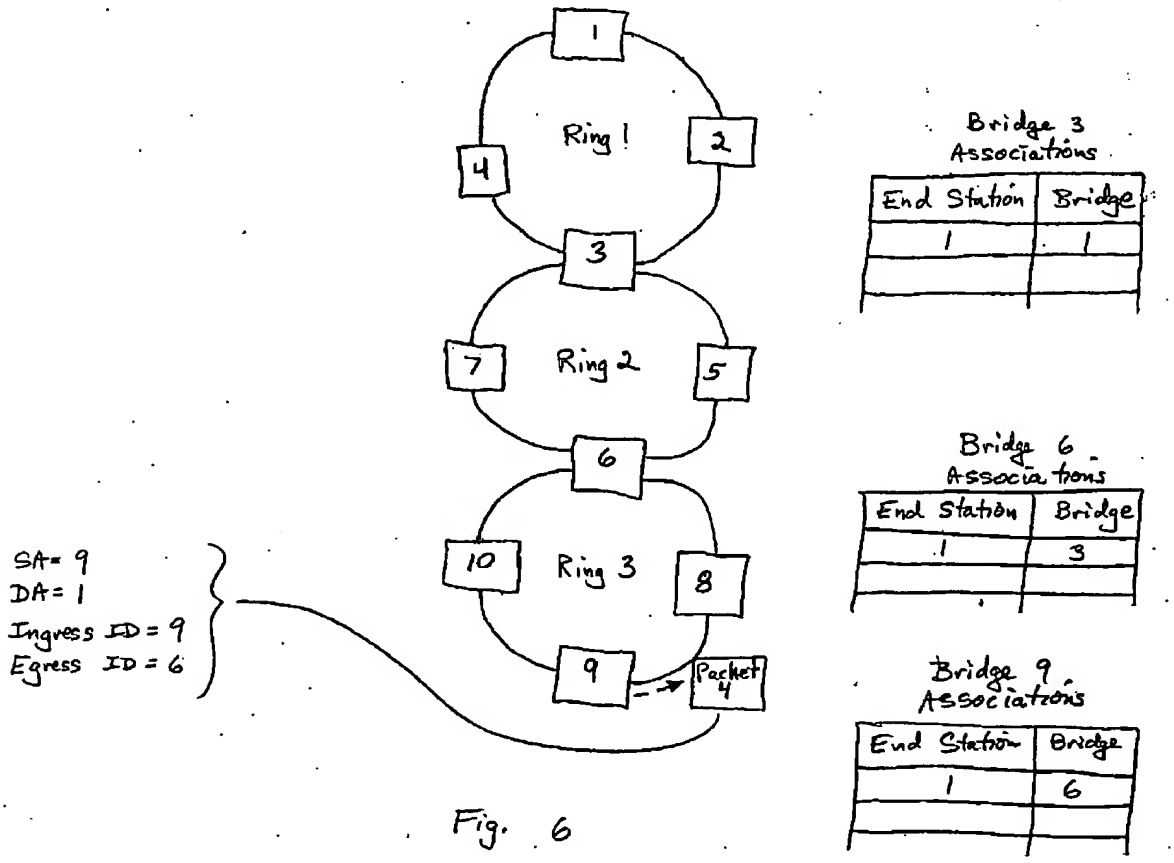

Fig. 6

Sending Packet 4 as a unicast transmission preserves bandwidth along portions of Ring 3 that the packets need not traverse.

Similarly, as shown in Fig. 7, Packet 4 reaches Bridge 6. The bridge previously associated the destination address (1) with a bridge (3), by which the packet can exit Ring 2 on its way to its destination. Thus, End Station/Bridge 6 sends Packet 5 as a unicast message to Bridge 3. In this case, the sender (End Station/Bridge 6) sets the Egress ID to 3.

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GAGNEBIN & LEBOVICI LLP
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FAX. (617) 451-0313

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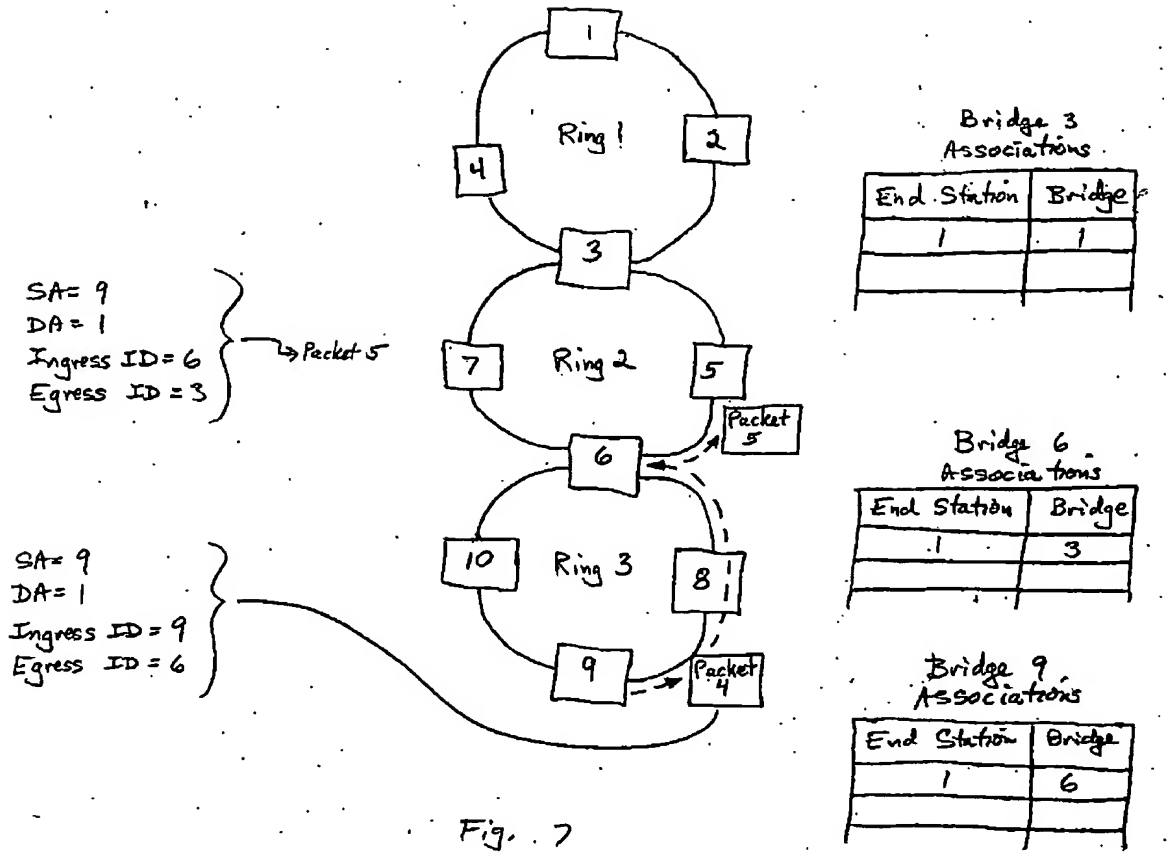

Fig. 7

Similarly, as shown in Fig. 8, Packet 5 reaches Bridge 3. The bridge previously associated the destination address (1) with end station/bridge 1, by which the packet can exit Ring 1 on its way to its destination. Thus, End Station/Bridge 3 sends Packet 6 as a unicast message to End Station 1.

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GAGNEBIN & LEBOVICI LLP
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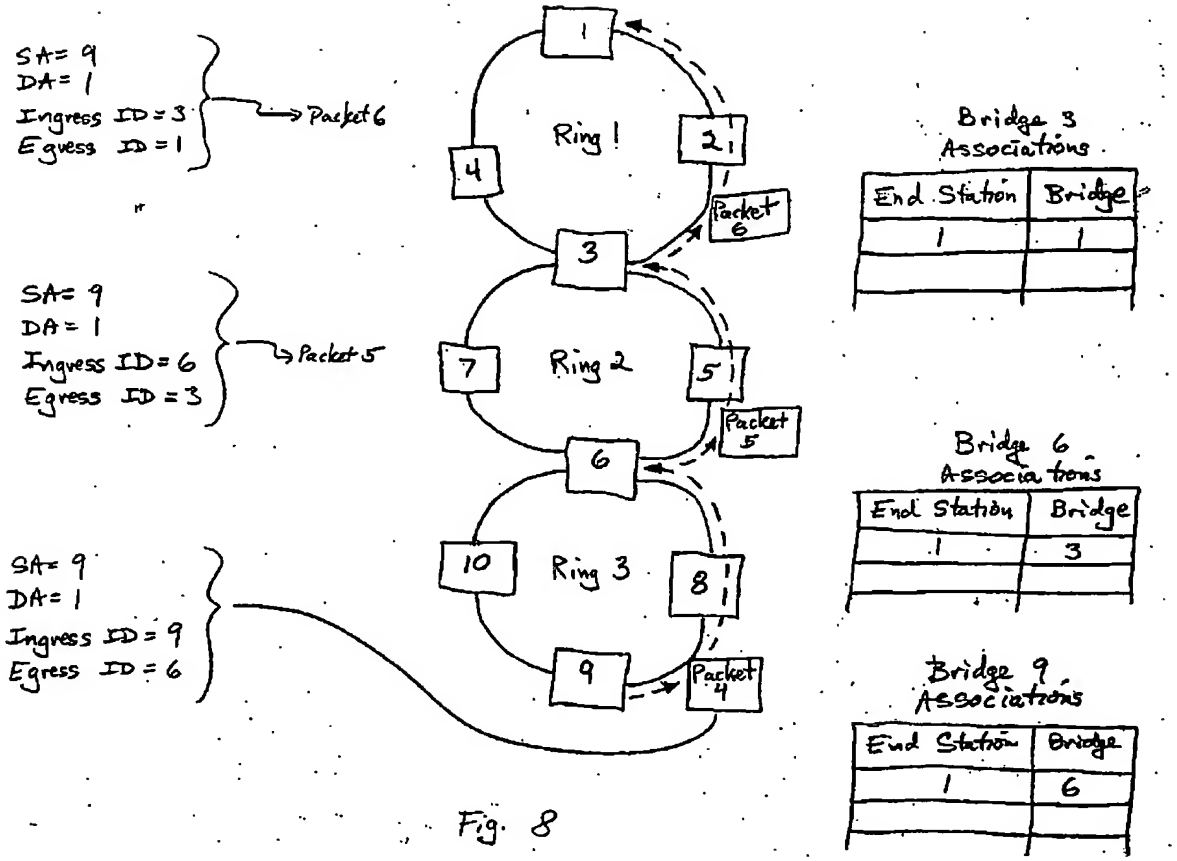

Fig. 8

Thus, a second bridge (such as Bridge 6) learns an association between a first bridge (such as Bridge 3) and an end station (such as End Station 1). Upon receiving a packet destined for the end station, if the association between the first bridge and the end station has not yet been learned, the bridge (ex., Bridge 6) forwards the received packet as a broadcast transmission on the ring. On the other hand, if the association between the first bridge and the end station has been learned, the bridge (ex., Bridge 6) forwards the received packet as a unicast transmission to the first bridge (ex., Bridge 3) on the ring.

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Coden

In contrast, Coden does not disclose selecting whether a second bridge forwards a packet as a broadcast transmission on a ring or as a unicast transmission on the ring, based on whether the second bridge has learned an association between a first bridge and an end station.

With regard to the present invention, it should be noted that, regardless of whether the packet is forwarded as a broadcast transmission or as a unicast transmission, a system, as claimed, forwards the packet on a ring. ("...(i) to forward the received packet as a broadcast transmission on the ring in the event that the association between the first bridge and the end station has not yet been learned, and (ii) to forward the received packet as a unicast transmission to the first bridge on the ring in the event that the association between the first bridge and the end station has been learned.") (Claim 1; emphasis added.)

In contrast, the first cited portion of Coden (i.e., col. 3, line 59 to col. 4, line 8) does not describe a ring network at all. The cited portion describes a conventional Ethernet switch. (Col. 3, lines 51-58.) Coden goes on to say that conventional Ethernet switches cannot be configured in a unidirectional ring network. (Col. 4, lines 21-33, *et. seq.*) Thus, the cited portion of Coden is irrelevant to ring networks. Claim 1 recites, "a data communications ring configured for spatial reuse; and first and second bridges coupled to the ring," as well as, "forward[ing] the received packet as a broadcast transmission on the ring," and "forward[ing] the received packet as a unicast transmission to the first bridge on the ring."

Even if, *arguendo*, the cited portion of Coden applies to ring networks, the cited portion does not disclose a switch that learns an association between another bridge (or another switch) and an end station. Coden discloses a switch that learns an association between a port of a switch and a destination address.

> Furthermore, when a packet is received at a port of the switch, the destination address of the packet is compared to the memory tables for the other ports of the switch. When a match is found for the destination address in the tables for one of the ports, the packet is switched to and sent out that port. (Col. 3, lines 59-64.)

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TEL. (617) 542-2290
FAX. (617) 451-0313

In Coden, the learned port is part of the switch. In contrast, the recited learned bridge is external to the learning bridge. Thus, the claimed invention learns an entirely different thing than Coden's switch learns.

Even if, *arguendo*, a port is analogous to a bridge, using Coden's teaching in the context of the present invention would not provide the advantages of the disclosed and claimed invention. Each bridge in the present invention is connected to each ring via only one port[1]. Learning an association between a port and an end station (or destination address) would provide no advantage, because the bridge sends all packets onto the ring over the one port connected to the ring. Therefore, knowing which port to use to introduce a packet into the ring would be useless to a bridge in a ring network.

A port is different than a bridge. *Learning an association between a destination address and a port does not enable Coden's switch to send a unicast packet over the ring, where he would otherwise have sent a broadcast packet.* Learning the association between a destination address and a port simply enables Coden to send the packets out the correct port. Without more information, Coden must still send broadcast packets out the port. In other words, *learning what port a packet should be sent out does not tell Coden's switch to what bridge the switch should to send the packet,* as disclosed and claimed in the present Application.

The second cited portion of Coden (col. 10, line 64 to col. 11, line 30) relates to ring switches. However, this portion of Coden adds nothing to the earlier teaching, i.e., associating a destination address with a port (not a bridge), relative to the present Application. The second cited portion discloses ring switches 104-1 to 104-N that include two ports (a ring-in port and a ring-out port) per connection to a ring. The two ports simply separate incoming traffic from outgoing traffic. Each switch also includes local ports, such as for connection to a local area network (LAN). The switch builds a table that lists source addresses from packets received over the ring-in port. If a switch can receive a packet from an entity over its ring-in port, the switch can send a packet to the same entity via its ring-out port. Thus, the switch learns which destination addresses can be reached

[1]The associations discussed in the present Application and in Coden relate to only egress ports. In unidirectional rings, each bridge is connected to each ring via one egress port. Although each bridge is also connected to each ring via one ingress port, packets are not sent out the ingress port. Thus, ingress ports are not relevant to the present discussion.

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TEL. (617) 542-2290
FAX. (617) 451-0313

via the ring-out port of the switch. The switch sends packets with these destination addresses via the ring-out port, rather than sending these packets via the local ports.

As discussed above, a ring-out port is different than a bridge. Learning an association between a destination address and a ring-out port does not enable Coden's switch to send unicast packets over the ring, where he would otherwise have sent broadcast packets, as recited in claim 1. In fact, Coden does not disclose any decisions regarding broadcast versus unicast forwarding.

No art of record, either alone or in combination, discloses or suggests a data communications network that includes first and second bridges coupled to a ring configured for spatial reuse, wherein the second bridge is operative (1) to learn an association between the first bridge and an end station, and (2) upon receiving a packet destined for the end station: (i) to forward the received packet as a broadcast transmission on the ring in the event that the association between the first bridge and the end station has not yet been learned, and (ii) to forward the received packet as a unicast transmission to the first bridge on the ring in the event that the association between the first bridge and the end station has been learned, as recited in claim 1. (Emphasis added.) For at least this reason, claim 1 is believed to be allowable.

Claims 2-8 depend directly or indirectly from claim 1. These dependent claims are, therefore, believed to be allowable, for at least the reasons given above with respect to claim 1.

The Examiner rejected claim 9 for essentially the same reason as claim 1. Claim 9 is believed to be allowable, for at least the reasons given above with respect to claim 1. Claims 10-16 depend directly or indirectly from claim 9. These dependent claims are, therefore, believed to be allowable, for at least the reasons given above.

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
TEL. (617) 542-2290
FAX. (617) 451-0313

For all the foregoing reasons, and due to the inapplicability of the art of record to the claimed invention, it is respectfully submitted that the present Application is in a condition for allowance, and such action is earnestly solicited. Alternatively, the Applicant respectfully requests that the finality of the above-identified Office Action be withdrawn. The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present Application.

Respectfully submitted,

ROBERT SULTAN

By: _____
George J. Jakobsche
Registration No. 39,236
Attorney for Applicant(s)

WEINGARTEN, SCHURGIN,
GAGNEBIN & LEBOVICI LLP
Ten Post Office Square
Boston, MA 02109
Telephone: (617) 542-2290
Telecopier: (617) 451-0313

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